

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>H04R 1/02, H04M 1/03, G06F 1/16,</b> <b>H04R 7/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/69212</b> <b>(43) International Publication Date:</b> 16 November 2000 (16.11.00)
<b>(21) International Application Number:</b> PCT/GB00/01427 <b>(22) International Filing Date:</b> 25 April 2000 (25.04.00)  <b>(30) Priority Data:</b> 9909157.1                      22 April 1999 (22.04.99)                      GB  <b>(71) Applicant (for all designated States except US):</b> NEW TRANS- DUCERS LIMITED [GB/GB]; Ixworth House, 37 Ixworth Place, London SW3 3QH (GB).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> COLLOMS, Martin [GB/GB]; 22 Burgess Hill, London NW2 2DA (GB). AZIMA, Henry [CA/GB]; 3 Southacre Close, Chaucer Road, Cambridge (GB).  <b>(74) Agent:</b> MAGUIRE BOSS; 5 Crown Street, St. Ives, Cam- bridgeshire PR27 5EB (GB).		<b>(81) Designated States:</b> AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
<b>(54) Title:</b> SMALL ELECTRONIC ARTICLES FOR PERSONAL USE		
<b>(57) Abstract</b> <p>A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing.</p>		

*FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

5        TITLE:        SMALL ELECTRONIC ARTICLES FOR PERSONAL USE

10                                DESCRIPTION

15                                TECHNICAL FIELD

The invention relates to small electronic articles for personal use, such for example, as mobile telephones, personal organisers and pocket radios.

It is an object of the invention to provide means  
20 whereby such electronic articles can be made to have an audio output without substantially adding to the weight or bulk of the article.

DISCLOSURE OF INVENTION

25        According to the invention, there is provided a personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a

vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing. Thus the personal portable electronic article is sufficiently small to be hand-held.

The radiator may be co-moulded integrally with the body or casing.

10 The radiator may be transparent and may, for example, define a display screen area.

The article may be a communications device, e.g. a cellular telephone.

The radiator may be a distributed mode acoustic radiator speaker e.g. of the kind described in WO97/09842.

#### BRIEF DESCRIPTION OF DRAWINGS

The invention is diagrammatically illustrated, by way of example, in the accompanying drawings, in which:-

Figure 1 is a front perspective view of a personal organiser incorporating a loudspeaker;

Figure 2 is a rear perspective view of the organiser shown in Figure 2;

25 Figure 3 is a front perspective view of a mobile telephone, and

Figure 4 is a rear perspective view of the telephone of Figure 4.

Figure 5 is a perspective view of a further embodiment of mobile telephone, and

Figure 6 is a partial cross-section through the casing of the mobile telephone of Figure 5.

5

#### BEST MODES FOR CARRYING OUT THE INVENTION

The personal organiser (1) shown in Figures 1 and 2 comprises a body (2) having a keyboard (3) and a lid (4) hinged to the body (2) and adapted to cover the keyboard, 10 the lid incorporating a visual display screen (6). The lid (4) is injection moulded from a suitable plastics material and comprises an integrally moulded bending wave acoustic radiator (12) driven by a vibration exciter (9) to form a loudspeaker, e.g. of the kind generally described in 15 WO97/09842.

Figures 3 and 4 show a mobile telephone (7) having a casing or body (8) having a front face (10) formed with a display panel (16) and a keypad (17). The rear face (11) of the casing of the telephone is formed integrally by 20 injection moulding with a bending wave acoustic radiator (12) driven by a piezo electric transducer or vibration exciter (9) to form a loudspeaker e.g. of the kind described in WO97/09842.

Thus in the arrangements of Figures 1 to 4 the casing 25 or body of the personal portable electronics article is injection moulded from plastics and a generally rectangular relatively thin acoustically active sub area of the casing or body is integrally moulded into the casing or body and

is bounded e.g. by a groove to provide a resilient suspension or alternatively by a thickened area or ridge to define the boundary of the panel. Slots (not shown) may be provided in the groove (18) and which pierce through the body or casing to increase the compliance of the suspension provided by the groove. Alternatively a resilient suspension, e.g. of elastomer may be co-moulded with the casing or body and the radiator panel can also be co-moulded directly on to the suspension.

10 In the mobile telephone (27) shown in Figures 5 and 6, which is generally similar to that of Figures 3 and 4, a front casing part (20) of the device (27) is formed with an acoustic radiator (X) including a transparent cover (19) over a visual display (16) which is excited by an inertial  
15 electrodynamic vibration exciter (9)

The invention thus provides a simple method of directly incorporating loudspeakers in small personal portable electronics articles.

CLAIMS

1. A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted,  
5 characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator  
10 defines a sub-area of the body or casing.
2. A personal portable electronic article according to claim 1, characterised in that the radiator is co-moulded integrally with the body or casing.
3. A personal portable electronic article according to  
15 claim 1 or claim 2, characterised in that the radiator is transparent.
4. A personal portable electronic article according to any one of claims 1 to 3, characterised in that the article is a communications device.
- 20 5. A personal portable electronic article according to claim 4, characterised in that the communications device is a cellular telephone.

1/3

Figure 1

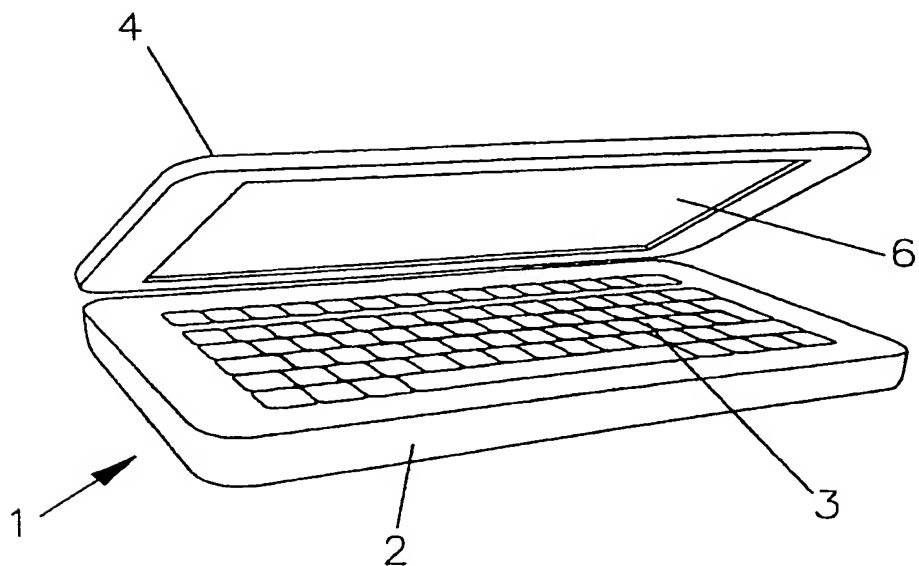
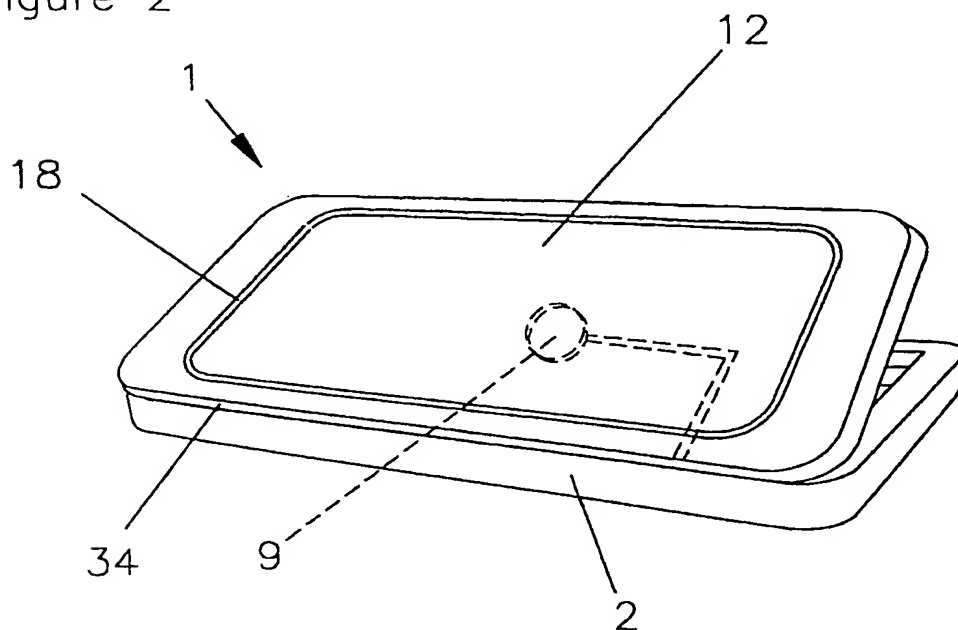


Figure 2





2/3

Figure 3

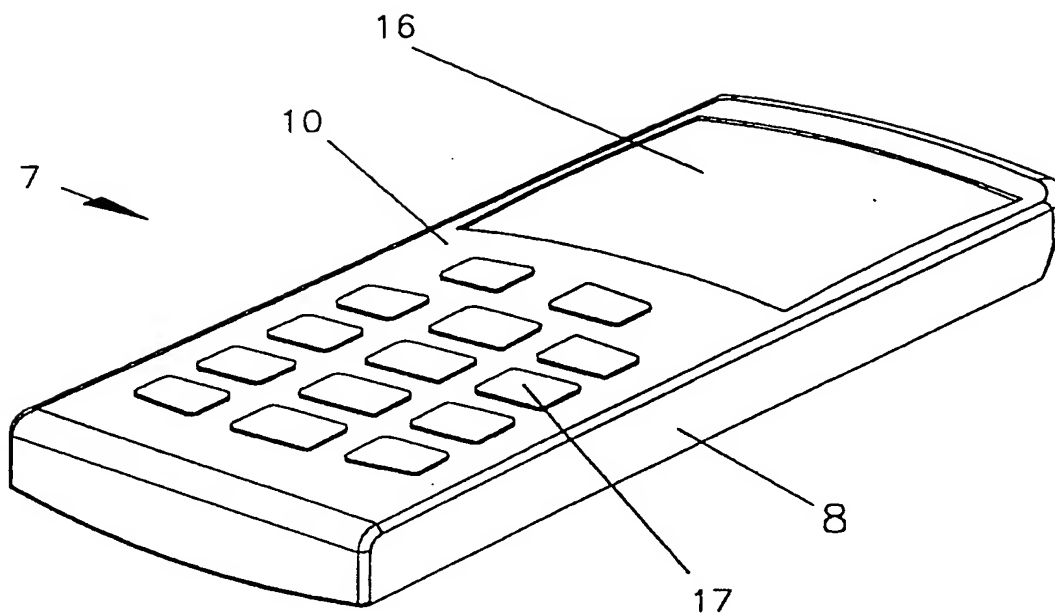
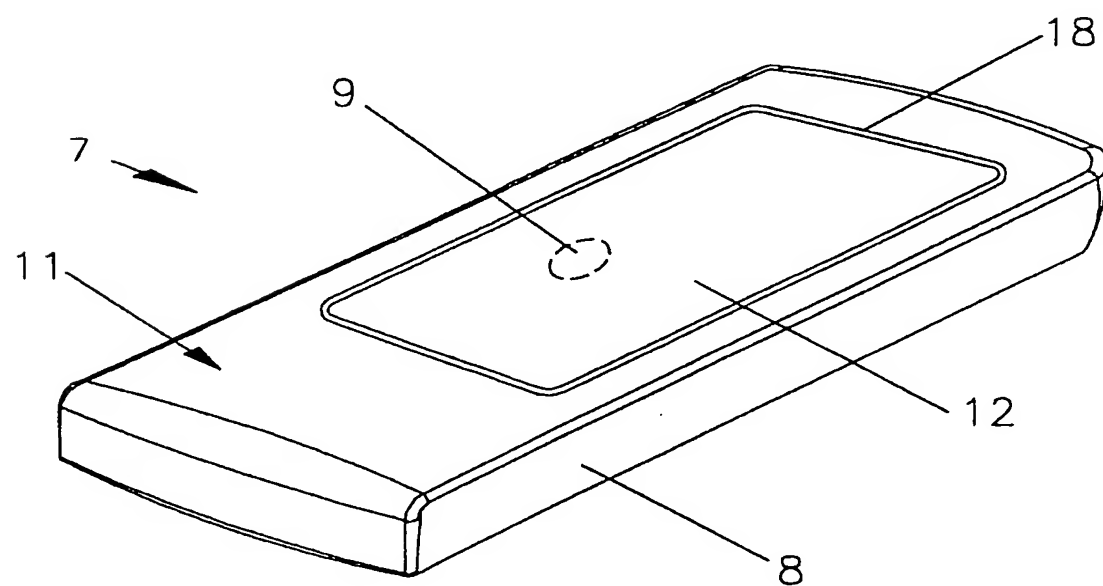


Figure 4



3/3

Figure 5.

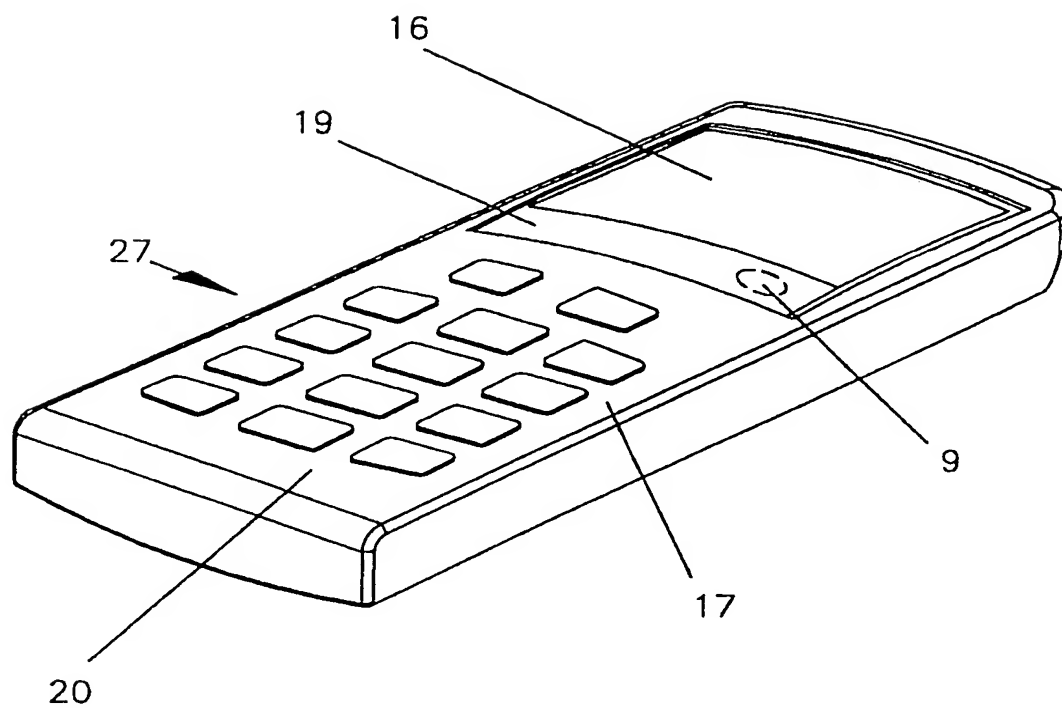
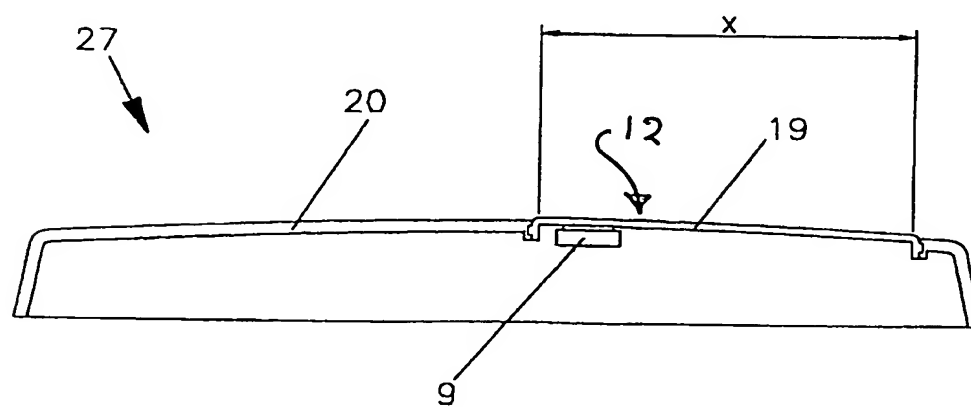


Figure 6



# INTERNATIONAL SEARCH REPORT

Int. l. Application No  
PCT/GB 00/01427

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04R1/02 H04M1/03 G06F1/16 H04R7/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H04R G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 43464 A (NEW TRANSDUCERS LTD ;AZIMA HENRY (GB); COLLOMS MARTIN (GB); CROCKE) 1 October 1998 (1998-10-01) page 4, line 6 -page 8, line 25; figures ----	1-5
Y	US 5 831 818 A (DAT ROVINDRA) 3 November 1998 (1998-11-03) column 2, line 39 -column 4, line 11; figures ----	1-5
A	WO 97 09842 A (AZIMA HENRY ;HARRIS NEIL (GB); COLLOMS MARTIN (GB); VERITY GROUP P) 13 March 1997 (1997-03-13) cited in the application page 70, line 21 - line 35; figure 29 ----- -/--	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

19 October 2000

Date of mailing of the international search report

26/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Gastaldi, G

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/01427

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 815 570 A (ANNERINO FRANK JOHN ET AL) 29 September 1998 (1998-09-29) column 2, line 3 -column 4, line 28 ---	4,5
A	WO 98 21702 A (SYNAPTICS INC) 22 May 1998 (1998-05-22) page 11, line 12 -page 15, line 29; figures ---	1
P,X	WO 00 02417 A (NEW TRANSDUCERS LTD ;AZIMA HENRY (GB); MORECROFT DENIS (GB)) 13 January 2000 (2000-01-13) column 2, line 17 -column 8, line 14; figures ---	1
A	US 5 815 225 A (NELSON RICHARD F) 29 September 1998 (1998-09-29) column 2, line 21 -column 4, line 10; figures -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/GB 00/01427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9843464 A	01-10-1998	AU 6511198 A BG 103732 A BR 9807880 A CN 1250586 T EP 0988772 A NO 994589 A PL 335804 A ZA 9802331 A	20-10-1998 31-05-2000 22-02-2000 12-04-2000 29-03-2000 21-09-1999 22-05-2000 23-09-1998
US 5831818 A	03-11-1998	NONE	
WO 9709842 A	13-03-1997	AT 177579 T AT 177574 T AT 177580 T AT 177575 T AT 186617 T AT 177581 T AT 177582 T AT 177583 T AT 177578 T AT 177576 T AT 179297 T AT 177577 T AT 179563 T AT 176826 T AT 179045 T AT 179296 T AT 177281 T AT 179564 T AT 177282 T AT 179043 T AT 179044 T AU 702865 B AU 6880196 A AU 702920 B AU 6880296 A AU 702867 B AU 6880396 A AU 703015 B AU 6880496 A AU 702863 B AU 6880596 A AU 702873 B AU 6880696 A AU 702999 B AU 6880796 A AU 703061 B AU 6880896 A AU 703000 B AU 6880996 A AU 703071 B AU 6881096 A AU 703058 B AU 6881296 A AU 705592 B AU 6881396 A AU 703296 B AU 6881496 A	15-03-1999 15-03-1999 15-03-1999 15-03-1999 15-11-1999 15-03-1999 15-03-1999 15-03-1999 15-03-1999 15-03-1999 15-05-1999 15-03-1999 15-05-1999 15-03-1999 15-04-1999 15-05-1999 15-03-1999 15-05-1999 15-03-1999 15-04-1999 15-04-1999 15-04-1999 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 11-03-1999 27-03-1997 25-03-1999 27-03-1997

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/GB 00/01427

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9709842 A		AU 699890 B AU 6881596 A AU 703198 B	17-12-1998 27-03-1997 18-03-1999
US 5815570 A	29-09-1998	CN 1150356 A	21-05-1997
WO 9821702 A	22-05-1998	US 5920310 A	06-07-1999
WO 0002417 A	13-01-2000	AU 4520599 A WO 0054548 A	24-01-2000 14-09-2000
US 5815225 A	29-09-1998	AU 6034598 A WO 9832067 A	07-08-1998 23-07-1998